

Technical Description

# Industrial Mechanic Millwright

Manufacturing and Engineering Technology



WorldSkills International, by a resolution of the Competitions Committee and in accordance with the Constitution, the Standing Orders and the Competition Rules, has adopted the following minimum requirements for this skill for the WorldSkills Competition.

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# 1 INTRODUCTION

## 1.1 NAME AND DESCRIPTION OF THE SKILL COMPETITION

1.1.1 The name of the skill competition is

Industrial Mechanic Millwright

1.1.2 Description of the associated work role(s) or occupation(s).

Industrial mechanic millwrights manufacture equipment, improve, modify and maintain, troubleshoot and repair industrial machinery, mechanical equipment, automated and robotic systems. There is a direct relationship between the nature and quality of the product required and the payment made by the customer/employer. Therefore, the industrial mechanic millwright has a continuing responsibility to work professionally in order to meet the requirements of the customer/employer and thus maintain and grow the business. Industrial mechanic millwrights are most often involved with installing, maintaining, troubleshooting, repairing, and removing machinery and equipment in industrial plants and factories.

The industrial mechanic millwright works indoors and outdoors, and on small and large projects. He or she will plan and design, select and install, commission, test, report, maintain, fault find mechanical industrial systems to a high standard. Work organization and self-management, communication and interpersonal skills, problem solving, flexibility, and a deep body of knowledge are the universal attributes of the outstanding industrial mechanic millwright.

Generally, the industrial mechanic millwright works in a team and occasionally alone. The individual takes on a high level of personal responsibility and autonomy. Every step in the process matters. This covers working to provide a safe mechanical installation and maintenance service, in accordance with relevant standards, through to diagnosing malfunctions, and commissioning stand-alone industrial mechanical and automated systems. Concentration, precision, accuracy, and attention to detail are all essential because mistakes are largely irreversible, costly and potentially life threatening.

With the international mobility of people, the industrial mechanic millwright faces rapidly expanding opportunities and challenges. For the talented industrial mechanic millwright there are many commercial and international opportunities; however, these carry with them the need to understand and work with diverse cultures and trends. The diversity of skills associated with industrial installations is therefore likely to expand.

1.1.3 Number of Competitors per team

Industrial Mechanics Millwright is a single Competitor skill competition.

1.1.4 Age limit of Competitors

The Competitors must not be older than 22 years in the year of the Competition.

## 1.2 THE RELEVANCE AND SIGNIFICANCE OF THIS DOCUMENT

This document contains information about the standards required to compete in this skill competition, and the assessment principles, methods and procedures that govern the competition.

Every Expert and Competitor must know and understand this Technical Description.

In the event of any conflict within the different languages of the Technical Descriptions, the English version takes precedence.

## 1.3 ASSOCIATED DOCUMENTS

Since this Technical Description contains only skill-specific information it must be used in association with the following:

- WSI – Competition Rules
- WSI – WorldSkills Standards Specification framework
- WSI – WorldSkills Assessment Strategy
- WSI Online resources as indicated in this document
- WorldSkills Health, Safety, and Environment Policy and Regulations

## 2 THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS)

### 2.1 GENERAL NOTES ON THE WSSS

The WSSS specifies the knowledge, understanding and specific skills that underpin international best practice in technical and vocational performance. It should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business ([www.worldskills.org/WSSS](http://www.worldskills.org/WSSS)).

In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will only be separate tests of knowledge and understanding where there is an overwhelming reason for these.

The Standards Specification is divided into distinct sections with headings and reference numbers added.

Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards Specification. This is often referred to as the “weighting”. The sum of all the percentage marks is 100.

The Marking Scheme and Test Project will assess only those skills that are set out in the Standards Specification. They will reflect the Standards Specification as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme and Test Project will follow the allocation of marks within the Standards Specification to the extent practically possible. A variation of five percent is allowed, provided that this does not distort the weightings assigned by the Standards Specification.

## 2.2 WORLDSKILLS STANDARDS SPECIFICATION

SECTION		RELATIVE IMPORTANCE (%)
1	<b>Work organization and management</b>	5
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The individual needs to know and understand:</li> <li>• Health and safety legislation, obligations and documentation</li> <li>• Principles of risk management</li> <li>• Principles of energy isolation and the need for verification</li> <li>• The principles of working safely with all forms of industrial equipment and industrial settings</li> <li>• Hazardous area work permit regulations</li> <li>• The situations when personal protective equipment must be used</li> <li>• The purposes, uses, care, maintenance, and storage of all tools and equipment together with their safety implications</li> <li>• The purposes, uses, care, and storage of materials</li> <li>• The importance of keeping a tidy and organized work area</li> <li>• Sustainability measures applying to the use of 'green' materials and recycling</li> <li>• The ways in which working practices can minimize waste and help to manage costs whilst maintaining quality</li> <li>• The principles of work flow and measurement</li> <li>• The significance of planning, quality, accuracy, checking, and attention to detail in all working practices</li> <li>• Impact of new technology</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Follow health and safety standards, rules, and regulations</li> <li>• Apply Risk Management techniques</li> <li>• Apply and verify (test for "zero") energy isolation</li> <li>• Diligently follow industrial safety procedures</li> <li>• Apply Hazardous Work Area requirements</li> <li>• Identify and use the appropriate personal protective equipment including safety footwear, ear, and eye protection</li> <li>• Select, use, clean, maintain, and store all tools and equipment safely</li> <li>• Select, use, and store all materials safely</li> <li>• Identify and take care of industrial equipment</li> <li>• Plan the work area to maximize efficiency and maintain the discipline of regular tidying</li> <li>• Prioritize work and manage time effectively</li> <li>• Work efficiently and check progress and outcomes regularly</li> <li>• Establish and consistently maintain high quality standards and working processes</li> <li>• Proactively engage in continuous professional development in order to effectively apply new technologies and working practices</li> </ul>	

<b>2</b>	<b>Planning and design</b>	<b>10</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>Standards, blueprints, schematics, work practices and installation requirements</li> <li>Procedures and technical manuals</li> <li>The management of materials and installation techniques used in different environments</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>Read, interpret, and revise drawings/blueprints and documentation including:               <ul style="list-style-type: none"> <li>layout and schematic drawings</li> </ul> </li> <li>Incorporate written instructions and work procedures</li> <li>Plan work using the provided blueprints, schematics, and technical documentation</li> </ul>	
<b>3</b>	<b>Communication and interpersonal skills</b>	<b>5</b>
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>The significance of establishing and maintaining customer/employer/stakeholder confidence and trust</li> <li>The importance of maintaining and keeping one's knowledge base up-to-date</li> <li>The roles and requirements of related trades</li> <li>The value of building and maintaining productive working relationships</li> <li>Techniques of effective teamwork</li> <li>The importance of swiftly resolving misunderstandings and conflicting demands</li> <li>The importance of accurate and concise reporting</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>Interpret customer requirements and positively manage customer/employer expectations</li> <li>Provide advice and guidance on products and/or solutions, for example using new technology applications such as preventative maintenance diagnostic tools</li> <li>Visualize and translate customer/employer wishes making recommendations which meet/improve their design and budgetary requirements</li> <li>Question customers/employers to fully understand requirements</li> <li>Provide clear instructions</li> <li>Introduce related trades to support customer/employer requirements</li> <li>Produce detailed written reports for work completed</li> <li>Produce a cost and time estimate for customers/employers</li> <li>Recognize and adapt to the changing needs of related trades</li> <li>Work effectively individually and as a member of a team</li> <li>Use oral communication to avoid misunderstandings</li> <li>Control personal conflicts in the workplace</li> </ul>	

4	Problem solving, innovation, and creativity	10
	The individual needs to know and understand: <ul style="list-style-type: none"> <li>• The common types of problem that can occur within the work process</li> <li>• Diagnostic approaches to problem solving and troubleshooting</li> <li>• Trends and developments in the industry including new technology, standards, and working methods, such as precision shaft alignment and thermography in preventing problems in industrial machinery</li> </ul>	
	The individual shall be able to: <ul style="list-style-type: none"> <li>• Check work regularly to minimize problems at a later stage in the process</li> <li>• Identify problems originating from the work of a related trade</li> <li>• Challenge incorrect technical information to prevent problems</li> <li>• Recognize and troubleshoot problems swiftly by following a self-managed logical process</li> <li>• Respond to opportunities to contribute ideas to improve the solution and overall level of customer/employer satisfaction</li> <li>• Demonstrate a willingness to try new methods and embrace change</li> </ul>	
5	Installation	30
	The individual needs to know and understand: <ul style="list-style-type: none"> <li>• Units of measurement used, &amp; the skilled use of these measuring devices</li> <li>• Principles of metal cutting and in the relationship between speeds and feeds during the various machining operations with work holding devices, accessories, and cutting tools</li> <li>• Machining operations of the milling machine and centre lathe to produce component parts to prescribed tolerances and standards</li> <li>• The applications and correct use of fasteners</li> <li>• Different types of lubricants their properties, applications and effects</li> <li>• Lifting protocols, correct hand signals, lifting, rigging, hoisting procedures, and SWL calculations for the removal and installation of mechanical industrial equipment</li> <li>• How to set-up and operate Oxy Fuel, SMAW, MIG, and TIG welding equipment</li> <li>• How to read welding drawings/blueprints</li> <li>• How to layout, develop, measure, assemble and tack fabricated metal parts and components together to specification and weld</li> <li>• The principles of foundation preparation and installation of a machine base or sole plate</li> <li>• Basic electrical and electronic theory</li> <li>• Basic electric and electronic terminology, schematics, applications, associated tools, installation and troubleshooting techniques</li> <li>• How to read and interpret engineering drawings/blueprints and schematics and use manufacturer's manuals</li> <li>• How to select, remove, install, and maintain anti-friction bearings and interpret ISO charts and bearing catalogues</li> <li>• The need to identify, remove, select, and install the appropriate power transmission system and/or components for a specific application</li> <li>• The use of precision measuring equipment as it pertains to part sizes, machine installation, set-up, alignment, and preventative maintenance</li> <li>• Types and principles of operation of various material handling systems</li> </ul>	



	<ul style="list-style-type: none"> <li>• The principles and applications of hydraulics/pneumatics and safety as they relate to fluid power systems.</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Select and install equipment from blueprints, plans and documentation Apply all machinery and equipment isolation (lock-out) and de-energizing procedures (mechanical and fluid power) before commencing work, maintenance, or overhaul procedures</li> <li>• Select and use hand cutting tools for shaping components to specifications</li> <li>• Use and interpret readings from a range of devices</li> <li>• Set up and safely operate the required machine tool</li> <li>• Use High Speed Steel and/or Carbide cutting tools to perform machining operations within a unit of tolerance</li> <li>• Identify and select bolts, nuts, dowels, snap rings, chemical fasteners, adhesives, and fasteners for specific applications</li> <li>• Comply with all safety rules, manufacturers' specifications and proper usage protocols' and environmental legislation when handling and storing lubricants</li> <li>• Select, inspect, and use the correct hoisting and rigging equipment and SWL calculations for specific applications</li> <li>• Apply metal inert gas (Oxy Fuel, SMAW, MIG, and TIG) welding and fabrication techniques including layout and joint preparation</li> <li>• Tack, prevent, and correct distortion, assemble fabricated components and weld as per supplied drawings and blueprints</li> <li>• Prepare foundations, machine bases or sole plates using the proper techniques for anchoring, shimming, and levelling for concrete or grouting pours</li> <li>• Apply correct lockout and tag-out and use a multi-meter to ensure electrical components are not "live" and to check for current and voltage</li> <li>• Using basic electrical testing instruments safely trouble shooting, remove, and reset electrical and electronic overload devices</li> <li>• Read and interpret 1st and 3rd orthographic projections, multi-view projections and auxiliary views of machine components, read, and interpret assembly and detail drawings of machine Remove, inspect, repair/replace, install, set clearance, fit, and align anti-friction bearings, using the bearing manufacturers' catalogues</li> <li>• Removal, inspect, repair or replace and install, align and tension/or sett "backlash", tooth pattern or impeller setting of a centrifugal pump, a reduction gearbox, chain drive, belt drive, or gear drive system</li> <li>• Identify, select, and use appropriate measuring/alignment devices/tools</li> <li>• Remove and install devices on material handling system</li> <li>• Identify, select and use appropriate measuring/alignment devices to align equipment and tack material handling systems drives and take appropriate readings/measurement</li> <li>• Repair, select, replace or remove as required the correct fluid power (pneumatic/hydraulic) device / piece of equipment to allow fluid power circuits and systems as per manufacturers' schematic drawings and requirements to function properly</li> <li>• Select the correct size and type of piping, tubes and hoses available for fluid power systems.</li> </ul>	

6	<b>Testing, reporting, and commissioning</b>	20
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• The essential features of quality assurance</li> <li>• Industrial regulations and standards applicable to different types of machines</li> <li>• Installation standards</li> <li>• Verification standards, methods and reports to be used to record verification results</li> <li>• Types of measuring instruments such as micrometres, vernier callipers,</li> <li>• Laser alignment/measuring tools/vibration analysis/thermography</li> <li>• Tools and software used for programming and commissioning</li> <li>• The correct operation of the machine installation in accordance with the planned specification and customer/employer requirements</li> <li>• Test equipment and safe work instructions</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Conduct tests safely, barricade isolate the work area</li> <li>• Test installations before energizing to ensure personal, electrical, and mechanical safety to include a complete visual inspection</li> <li>• Test installations when energized by checking complete function on all equipment installed to ensure correct operation of new/repaired or refurbished installation as per instructions</li> <li>• Set the installation to fully functioning and ensure operator can safely, effectively, and efficiently perform required functions to meet customer/employer satisfaction</li> <li>• Complete detailed commissioning reports</li> </ul>	
7	<b>Maintenance, fault finding, and repair</b>	20
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> <li>• Different types of installations and equipment for specific environments</li> <li>• Different generations of installations and equipment</li> <li>• The purpose of specific installations and equipment</li> <li>• The customers/employer’s needs for the various functions of installations and equipment</li> <li>• Diagnostic approaches to problem solving (Failure Modes and Root Causes analogies)</li> </ul>	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> <li>• Adapt to changing circumstances in “real time”</li> <li>• Use, test, and calibrate measuring and diagnostic equipment to find and locate faults during regular maintenance and troubleshooting protocols</li> <li>• Troubleshoot basic electrical faults, mechanical, power transmission and fluid power installations/systems</li> <li>• Repair faults once identified</li> <li>• Verify that existing installations and equipment still meet current standards</li> </ul>	

	<ul style="list-style-type: none"><li>• Use, test, and calibrate measuring and diagnostic equipment to find and locate faults during regular maintenance and troubleshooting protocols</li></ul>	
	<b>Total</b>	<b>100</b>

## 3 THE ASSESSMENT STRATEGY AND SPECIFICATION

### 3.1 GENERAL GUIDANCE

Assessment is governed by the WorldSkills Assessment Strategy. The Strategy establishes the principles and techniques to which WorldSkills assessment and marking must conform.

Expert assessment practice lies at the heart of the WorldSkills Competition. For this reason it is the subject of continuing professional development and scrutiny. The growth of expertise in assessment will inform the future use and direction of the main assessment instruments used by the WorldSkills Competition: the Marking Scheme, Test Project, and Competition Information System (CIS).

Assessment at the WorldSkills Competition falls into two broad types: measurement and judgement. For both types of assessment the use of explicit benchmarks against which to assess each Aspect is essential to guarantee quality.

The Marking Scheme must follow the weightings within the Standards Specification. The Test Project is the assessment vehicle for the skill competition, and also follows the Standards Specification. The CIS enables the timely and accurate recording of marks, and has expanding supportive capacity.

The Marking Scheme, in outline, will lead the process of Test Project design. After this, the Marking Scheme and Test Project will be designed and developed through an iterative process, to ensure that both together optimize their relationship with the Standards Specification and the Assessment Strategy. They will be agreed by the Experts and submitted to WSI for approval together, in order to demonstrate their quality and conformity with the Standards Specification.

Prior to submission for approval to WSI, the Marking Scheme and Test Project will liaise with the WSI Skill Advisors in order to benefit from the capabilities of the CIS.

## 4 THE MARKING SCHEME

### 4.1 GENERAL GUIDANCE

This section describes the role and place of the Marking Scheme, how the Experts will assess Competitors' work as demonstrated through the Test Project, and the procedures and requirements for marking.

The Marking Scheme is the pivotal instrument of the WorldSkills Competition, in that it ties assessment to the standards that represent the skill. It is designed to allocate marks for each assessed aspect of performance in accordance with the weightings in the Standards Specification.

By reflecting the weightings in the Standards Specification, the Marking Scheme establishes the parameters for the design of the Test Project. Depending on the nature of the skill and its assessment needs, it may initially be appropriate to develop the Marking Scheme in more detail as a guide for Test Project design. Alternatively, initial Test Project design can be based on the outline Marking Scheme. From this point onwards the Marking Scheme and Test Project should be developed together.

Section 2.1 above indicates the extent to which the Marking Scheme and Test Project may diverge from the weightings given in the Standards Specification, if there is no practicable alternative.

The Marking Scheme and Test Project may be developed by one person, or several, or by all Experts. The detailed and final Marking Scheme and Test Project must be approved by the whole Expert Jury prior to submission for independent quality assurance. The exception to this process is for those skill competitions which use an independent designer for the development of the Marking Scheme and Test Project. Please see the Rules for further details.

Experts and independent designers are required to submit their Marking Schemes and Test Projects for comment and provisional approval well in advance of completion, in order to avoid disappointment or setbacks at a late stage. They are also advised to work with the CIS Team at this intermediate stage, in order to take full advantage of the possibilities of the CIS.

In all cases a draft Marking Scheme must be entered into the CIS at least eight weeks prior to the Competition using the CIS standard spreadsheet or other agreed methods.

### 4.2 ASSESSMENT CRITERIA

The main headings of the Marking Scheme are the Assessment Criteria. These headings are derived in conjunction with the Test Project. In some skill competitions the Assessment Criteria may be similar to the section headings in the Standards Specification; in others they may be totally different. There will normally be between five and nine Assessment Criteria. Whether or not the headings match, the Marking Scheme as a whole must reflect the weightings in the Standards Specification.

Assessment Criteria are created by the person(s) developing the Marking Scheme, who are free to define criteria that they consider most suited to the assessment and marking of the Test Project. Each Assessment Criterion is defined by a letter (A-I). It is advisable not to specify either the Assessment Criteria, or the allocation of marks, or the assessment methods, within this Technical Description.

The Mark Summary Form generated by the CIS will comprise a list of the Assessment Criteria.

The marks allocated to each Criterion will be calculated by the CIS. These will be the cumulative sum of marks given to each Aspect within that Assessment Criterion.

## 4.3 SUB CRITERIA

Each Assessment Criterion is divided into one or more Sub Criteria. Each Sub Criterion becomes the heading for a WorldSkills marking form. Each marking form (Sub Criterion) contains Aspects to be assessed and marked by measurement or judgement, or both measurement and judgement.

Each marking form (Sub Criterion) specified both the day on which it will be marked, and the identity of the marking team.

## 4.4 ASPECTS

Each Aspect defines, in detail, a single item to be assessed and marked together with the marks, or instructions for how the marks are to be awarded. Aspects are assessed either by measurement or judgement.

The marking form lists, in detail, every Aspect to be marked together with the mark allocated to it.

The sum of the marks allocated to each Aspect must fall within the range of marks specified for that section of the skill in the Standards Specification. This will be displayed in the Mark Allocation Table of the CIS, in the following format, when the Marking Scheme is reviewed from C-8 weeks. (Section 4.1)

	CRITERIA								TOTAL MARKS PER SECTION	WSS MARKS PER SECTION	VARIANCE	
	A	B	C	D	E	F	G	H				
STANDARDS SPECIFICATION SECTION	1	5.00							5.00	5.00	0.00	
	2		2.00					7.50		10.00	0.50	
	3								11.00	10.00	1.00	
	4			5.00					5.00	5.00	0.00	
	5				10.00	10.00	10.00			30.00	30.00	0.00
	6		8.00	5.00				2.50	9.00	24.50	25.00	0.50
	7			10.00					5.00	15.00	15.00	0.00
TOTAL MARKS	5.00	10.00	10.00	10.00	10.00	10.00	15.00	20.00	100.00	100.00	2.00	

## 4.5 ASSESSMENT AND MARKING

There is to be one marking team for each Sub Criterion, whether it is assessed and marked by judgement, measurement, or both. The same marking team must assess and mark all competitors, in all circumstances. The marking teams must be organized to ensure that there is no compatriot marking in any circumstances. (See 4.6.)

## 4.6 ASSESSMENT AND MARKING USING JUDGEMENT

Judgement uses a scale of 0-3. To apply the scale with rigour and consistency, judgement must be conducted using:

- benchmarks (criteria) for detailed guidance for each Aspect (in words, images, artefacts or separate guidance notes)
- the 0-3 scale to indicate:
  - 0: performance below industry standard
  - 1: performance meets industry standard
  - 2: performance meets and, in specific respects, exceeds industry standard
  - 3: performance wholly exceeds industry standard and is judged as excellent

Three Experts will judge each Aspect, with a fourth to coordinate the marking and acting as a judge to prevent compatriot marking.

## 4.7 ASSESSMENT AND MARKING USING MEASUREMENT

Three Experts will be used to assess each aspect. Unless otherwise stated only the maximum mark or zero will be awarded. Where they are used, the benchmarks for awarding partial marks will be clearly defined within the Aspect.

## 4.8 THE USE OF MEASUREMENT AND JUDGEMENT

Decisions regarding the selection of criteria and assessment methods will be made during the design of the competition through the Marking Scheme and Test Project.

## 4.9 COMPLETION OF SKILL ASSESSMENT SPECIFICATION

The Test Project and Marking Scheme will reflect the WorldSkills Standards Specifications. The judgement and measurement marking forms will be formalized by the independent module designer/s in consultation with the Skill Competition Manager and Skill Advisor to make sure the Marking Schemes accurately reflect the WSSS.

## 4.10 SKILL ASSESSMENT PROCEDURES

- The Experts will split into working groups and assigned modules of work to mark. These groups will mark the same criteria for all Competitors;
- A timetable will be prepared by the Experts as to when the modules must be handed in for marking;
- These modules will be marked as and when they are completed and presented by the Competitor;
- An Expert must not mark their compatriot Competitor's module of work;
- Parts must be handed in for marking before final assembly of a module;
- Expert teams will be selected by the CE and the DCE;
- A mix of experience will be required in each Expert Team;
- The manual measuring tools which are used will be the same ones that are used to set the Competitors manual measuring tools;
- Competitors' standards;
- If a Competitor is issued with additional material/equipment it is agreed that a penalty is incurred in the marking scale. This needs to be confirmed on the drawing to ensure consistency for Competitors and Experts. Maximum penalty of two marks for each additional piece of material or equipment;
- Any additional material given to a competitor must be signed off by two Experts (not compatriot Expert) to ensure consistency;
- Any details to be manufactured by the Competitor must be manufactured as per the supplied drawing with the specified process/equipment supplied and to industry standard with the correct usage of equipment at all times during the process;

If equipment is used inappropriately/unsafely there will be a penalty of two marks per infringement due to the unsafe/incorrect use of equipment, this will be signed off by two Experts (not compatriot Expert) to ensure consistency.

## 5 THE TEST PROJECT

### 5.1 GENERAL NOTES

Sections 3 and 4 govern the development of the Test Project. These notes are supplementary.

Whether it is a single entity, or a series of stand-alone or connected modules, the Test Project will enable the assessment of the skills in each section of the WSSS.

The purpose of the Test Project is to provide full, balanced and authentic opportunities for assessment and marking across the Standards Specification, in conjunction with the Marking Scheme. The relationship between the Test Project, Marking Scheme and Standards Specification will be a key indicator of quality, as will be its relationship with actual work performance.

The Test Project will not cover areas outside the Standards Specification, or affect the balance of marks within the Standards Specification other than in the circumstances indicated by Section 2.

The Test Project will enable knowledge and understanding to be assessed solely through their applications within practical work.

The Test Project will not assess knowledge of WorldSkills rules and regulations.

This Technical Description will note any issues that affect the Test Project's capacity to support the full range of assessment relative to the Standards Specification. Section 0 refers.

### 5.2 FORMAT/STRUCTURE OF THE TEST PROJECT

Four standalone modules will be assessed each day as per the evaluation protocols.

The modules will be independently designed and will not be circulated. Competitors are given a range of skills, equipment, and tolerances required to compete the given modules.

### 5.3 TEST PROJECT DESIGN REQUIREMENTS

Test Project design requirements are as stated. All work must be done using the materials and the infrastructure in normal use in the Host Country/Region. An exception is those parts which the module designer has brought or which are provided;

- Tolerance range specification
- Any tolerance used on the drawing must be ISO format or be supplied.
- Mechanical - all items produced by the Competitor will be utilized.
- The tolerances must be able to be inspected with the measuring tools that are listed on the IL.
- The choice of surface finish must reflect the desired results keeping in mind the material type.
- The Test Project will include four separate modules involving multiple tasks, to be assessed according to the WSSS applicable to each task.
- Competitors must be able to work with the materials specified and must be able to comply with environmental requirements.
- Standalone module skill sets etc. will be circulated to the Experts via the WorldSkills Discussion Forum six months prior to the competition to allow for proper preparation by their Competitors'
- The total working time for all four modules will be 20 hours.

The following are the guidelines for the percentage of work in hours:

- Module 1 = 4hrs
- Module 2 = 4hrs
- Module 3 = 6hrs
- Module 4 = 6hrs



## 5.4 TEST PROJECT DEVELOPMENT

The Test Project MUST be submitted using the templates provided by WorldSkills International ([www.worldskills.org/expertcentre](http://www.worldskills.org/expertcentre)). Use the Word template for text documents and DWG template for drawings.

### 5.4.1 Who develops the Test Project or modules

An Independent Designer will design the four modules independently.

### 5.4.2 How and where is the Test Project or modules developed

The module will be designed independently by an Independent Designer.

### 5.4.3 When is the Test Project developed

The Test Project is developed according to the following timeline:

Development of the four-standalone modules will be completed three months prior to the Competition.

## 5.5 TEST PROJECT VALIDATION

The project designer/s will complete module validation, including; function, marking scale, and allotted time.

## 5.6 TEST PROJECT SELECTION

The Independent Designer/s decide the design of each of the four modules.

Module skill areas, skills sets, and parameters will be posted for the Experts via the Discussion Forum as with previous WorldSkills IMM competitions.

## 5.7 TEST PROJECT CIRCULATION

The Test Project is circulated via the website as follows:

The 4 standalone modules will not be circulated.

## 5.8 TEST PROJECT COORDINATION (PREPARATION FOR COMPETITION)

The Skill Competition Manager will undertake the coordination of the modules with the Independent Designers.

## 5.9 TEST PROJECT CHANGE AT THE COMPETITION

There will be NO standalone module change at the competition.

## 5.10 MATERIAL OR MANUFACTURER SPECIFICATIONS

Specific material and/or manufacturer specifications required to allow the Competitor to complete the Test Project will be supplied by the Competition Organizer and are available from [www.worldskills.org/infrastructure](http://www.worldskills.org/infrastructure) located in the Expert Centre.

The Competition Organizer undertakes to provide information on the following equipment on the Infrastructure List.

- Machine tools and accessories;
- Welding equipment and tools;
- Fabrication equipment and tools;
- Required hand, power, precision measurement, and preventative maintenance tools.

## 6 SKILL MANAGEMENT AND COMMUNICATION

### 6.1 DISCUSSION FORUM

Prior to the Competition, all discussion, communication, collaboration, and decision making regarding the skill competition must take place on the skill specific Discussion Forum (<http://forums.worldskills.org>). Skill related decisions and communication are only valid if they take place on the forum. The Chief Expert (or an Expert nominated by the Chief Expert) will be the moderator for this Forum. Refer to Competition Rules for the timeline of communication and competition development requirements.

### 6.2 COMPETITOR INFORMATION

All information for registered Competitors is available from the Competitor Centre ([www.worldskills.org/competitorcentre](http://www.worldskills.org/competitorcentre)).

This information includes:

- Competition Rules
- Technical Descriptions
- Mark Summary Form (where applicable)
- Test Projects (where applicable)
- Infrastructure List
- WorldSkills Health, Safety, and Environment Policy and Regulations
- Other Competition-related information

### 6.3 TEST PROJECTS [AND MARKING SCHEMES]

Circulated Test Projects will be available from [www.worldskills.org/testprojects](http://www.worldskills.org/testprojects) and the Competitor Centre ([www.worldskills.org/competitorcentre](http://www.worldskills.org/competitorcentre)).

### 6.4 DAY-TO-DAY MANAGEMENT

The day-to-day management of the skill during the Competition is defined in the Skill Management Plan that is created by the Skill Management Team led by the Skill Competition Manager. The Skill Management Team comprises the Skill Competition Manager, Chief Expert and Deputy Chief Expert. The Skill Management Plan is progressively developed in the six months prior to the Competition and finalized at the Competition by agreement of the Experts. The Skill Management Plan can be viewed in the Expert Centre ([www.worldskills.org/expertcentre](http://www.worldskills.org/expertcentre)).

## 7 SKILL-SPECIFIC SAFETY REQUIREMENTS

Refer to WorldSkills Health, Safety, and Environment Policy and Regulations for Host country or region regulations.

- All Experts and Competitors must use/wear proper PPE at all times while on the competition site;
- Experts will use the appropriate personal safety equipment when inspecting, checking or working with a Competitor's project;
- The documentation 'Safety and Fairness' will be prepared by the Experts;
- The Competitor must comply with the machine manufacturer's safety instructions.

## 8 MATERIALS AND EQUIPMENT

### 8.1 INFRASTRUCTURE LIST

The Infrastructure List details all equipment, materials and facilities provided by the Competition Organizer.

The Infrastructure List is available at [www.worldskills.org/infrastructure](http://www.worldskills.org/infrastructure).

The Infrastructure List specifies the items and quantities requested by the Experts for the next Competition. The Competition Organizer will progressively update the Infrastructure List specifying the actual quantity, type, brand, and model of the items. Items supplied by the Competition Organizer are shown in a separate column.

At each Competition, the Experts must review and update the Infrastructure List in preparation for the next Competition. Experts must advise the Director of Skills Competitions of any increases in space and/or equipment.

At each Competition, the Technical Observer must audit the Infrastructure List that was used at that Competition.

The Infrastructure List does not include items that Competitors and/or Experts are required to bring and items that Competitors are not allowed to bring – they are specified below.

### 8.2 COMPETITORS TOOLBOX

Competitors are not required to bring a toolbox.

### 8.3 MATERIALS, EQUIPMENT, AND TOOLS SUPPLIED BY COMPETITORS IN THEIR TOOLBOX

Not applicable.

### 8.4 MATERIALS, EQUIPMENT, AND TOOLS SUPPLIED BY EXPERTS

Not applicable.

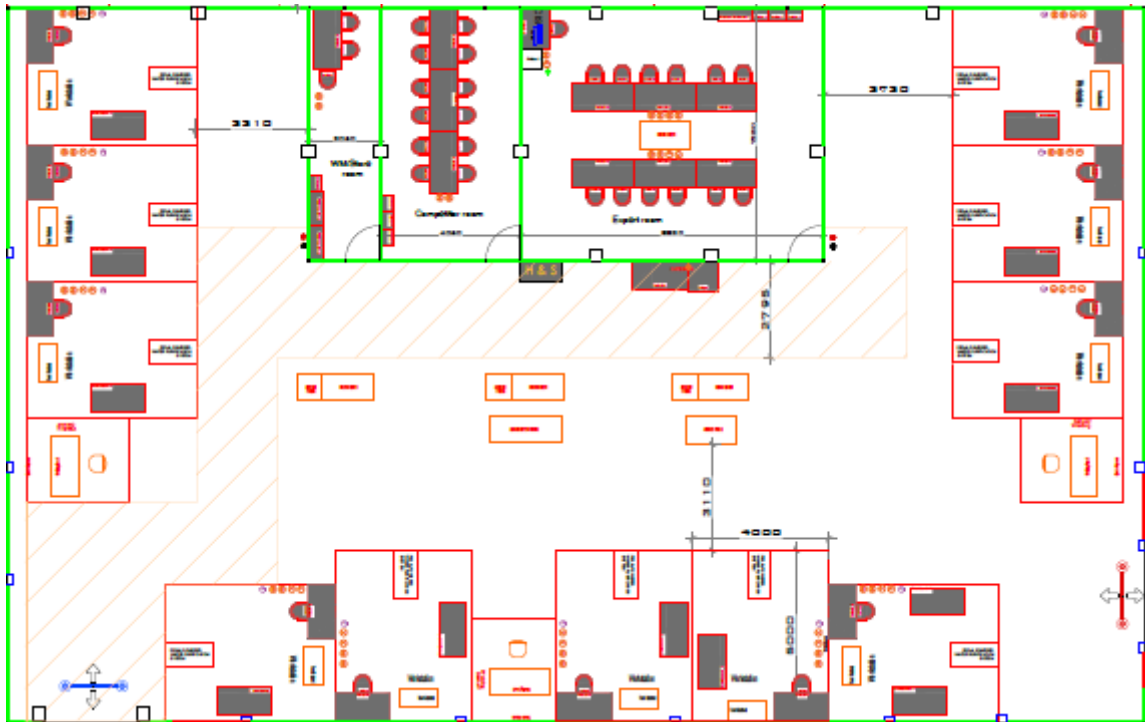
### 8.5 MATERIALS AND EQUIPMENT PROHIBITED IN THE SKILL AREA

No outside materials or equipment are allowed on the competition site, all required materials and equipment is supplied by the Competition Organizers and competition Sponsors.

## 8.6 PROPOSED WORKSHOP AND WORKSTATION LAYOUTS

Workshop layouts from previous competitions are available at [www.worldskills.org/sitelayout](http://www.worldskills.org/sitelayout).

Example workshop layout:



## 9 SKILL-SPECIFIC RULES

Skill-specific rules cannot contradict or take priority over the Competition Rules. They do provide specific details and clarity in areas that may vary from skill competition to skill competition. This includes but is not limited to personal IT equipment, data storage devices, internet access, procedures and workflow, and documentation management and distribution.

TOPIC/TASK	SKILL-SPECIFIC RULE
Use of technology – USB, memory sticks	<ul style="list-style-type: none"> <li>Competitors, Experts, and Interpreters are not allowed to bring memory sticks into the workshop. The Chief and Deputy Chief Expert are exempt from this rule.</li> </ul>
Use of technology – personal laptops, tablets and mobile phones	<ul style="list-style-type: none"> <li>Competitors, Experts, and Interpreters are not allowed to bring personal laptops, tablets or mobile phones into the workshop. The Chief and Deputy Chief Expert are exempt from this rule.</li> </ul>
Use of technology – personal photo and video taking devices	<ul style="list-style-type: none"> <li>Competitors, Experts, and Interpreters are not allowed to use personal photo and video taking devices in the workshop from C-6 until C+1.</li> <li>Competitors are not allowed to take photographs as they progress through their project work. If required designated Experts will record the Competitors work at each sign off point.</li> </ul>
Drawings, recording information	<ul style="list-style-type: none"> <li>Competitors, Experts, and Interpreters are not permitted to bring drawings or prepared information into the workshop</li> </ul>
Health, Safety, and Environment	<ul style="list-style-type: none"> <li>Refer to the WorldSkills Health, Safety, and Environment policy and guidelines document.</li> </ul>
Templates, aids, etc.	<ul style="list-style-type: none"> <li>Competitors are not permitted to bring or use templates/patterns and prepared parts.</li> </ul>

## 10 VISITOR AND MEDIA ENGAGEMENT

The following list provides examples of how this skill competition may be more attractive for the media and visitors:

- Try-A-Skill;
- Display screens;
- Test Project descriptions;
- Enhanced understanding of Competitor activity;
- Competitor profiles;
- Career opportunities;
- Daily reporting of competition status.



## 11 SUSTAINABILITY

This skill competition will focus on the sustainable practices below:

- Recycling - All waste generated by the Competitors on the competition site will be recycled;
- Use of 'green' materials - where possible the use of "green" materials will be maximized;
- Use of completed Test Projects after Competition – some of the completed Modules will be donated to local technical institutions, colleges, universities, and high schools. Sponsor supplied tools, accessories and equipment will be returned at the completion of the competition.

## 12 REFERENCES FOR INDUSTRY CONSULTATION

WorldSkills is committed to ensuring that the WorldSkills Standards Specifications fully reflect the dynamism of internationally recognized best practice in industry and business. To do this WorldSkills approaches a number of organizations across the world that can offer feedback on the draft Description of the Associated Role and WorldSkills Standards Specification on a two-yearly cycle.

In parallel to this, WSI consults three international occupational classifications and databases:

- ISCO-08: (<http://www.ilo.org/public/english/bureau/stat/isco/isco08/>)
- ESCO: (<https://ec.europa.eu/esco/portal/home> )
- O\*NET OnLine ([www.onetonline.org/](http://www.onetonline.org/))

This WSSS (Section 2) appears most closely to relate to *Industrial Machinery Mechanics*:

<https://www.onetonline.org/link/summary/49-9041.00>

and *Industrial Machinery Mechanic*: <http://data.europa.eu/esco/occupation/269c47e7-9017-4aa6-bce8-49e89a696a64>

These links also allow adjacent occupations to be explored.